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Role of clinical suspicion in pediatric blunt trauma patients with severe mechanisms of injury☆

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ABSTRACT

Objectives: In adult patients with blunt trauma, severe mechanism of injury leads to routine pan-computed tomography (CT). Due to concerns about the risk of radiation, we sought to determine whether clinical suspicion could identify children requiring radiographic imaging.

Methods: A prospective study was conducted in a pediatric emergency department of a Level 1 trauma center. Patients ≤ 14 years presenting with blunt trauma due to predefined severe mechanisms were eligible. Physicians recorded their suspicions for clinically significant injury (CSI). Imaging was obtained at the physician's discretion. CSI was defined as injury requiring intervention or hospital admission ≥ 24 h. Both admitted and discharged patients were contacted ≥ 2 weeks after presentation to document undetected injuries.

Results: 837 patients were eligible; 753 were enrolled. 159 patients were excluded because the mechanism did not meet severity criteria. Follow-up was completed for 529/594 remaining patients. Physicians were suspicious of all injuries in 71/75 patients with CSI and had no suspicions in 382/454 without CSI. The 75 injured patients had 153 CSIs; positive suspicion of CSI was recorded for 149 injuries. The four patients who sustained unsuspected injuries had multiple other suspected injuries. Of the 594 patients, 42 received focused CT and 14 underwent pan-CT. No patient had previously undetected injuries on follow-up.

Conclusion: In our study, clinical suspicion was able to identify children with CSI. If further studies support our findings, using clinical suspicion rather than mechanism alone to guide radiographic imaging may avoid unnecessary radiation exposure.

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1. Background

Mechanism of injury is often used to guide transport to a trauma center and activate trauma team response in patients with blunt trauma [1-3]. In many institutions, trauma team activations automatically trigger routine pan-computed tomography (pan-CT) – CT of the head, cervical spine, chest, abdomen and pelvis with or without reconstruction of the thoracolumbosacral spine – regardless of clinical presentation [2]. Several authors report that early use of pan-CT is associated with decreased morbidity [4] and may reveal previously undetected injuries [2,5,6], even in patients without obvious signs or symptoms [2,5]. Moreover, even pan-CTs with normal results have been considered beneficial in facilitating patient disposition [5,6].

Utilization of CT is increasing at an alarming rate [7]. It is estimated that as many as 9.35 million CTs are performed annually on children in the United States. This is projected to result in 4870 radiation-induced pediatric cancers per year [8]. The lifetime risk of malignancy due to radiation is much higher for children than in adults due to their rapidly dividing cells, their increased lifetime risk per unit dose of radiation and their larger dose per body area [9,10]. This risk is believed to increase exponentially with decreasing age.

Most injured children are treated in adult trauma centers [11] and pan-CT based on severe mechanism of injury is supported by much of the adult literature [2,4-6,12,13]. In a study by Jindal et al., pediatric patients with mild to moderate trauma, underwent over twice the number of CTs as their adult counterparts [14]. It is essential to determine whether mechanism of injury should be the sole indication for imaging children with blunt trauma in the absence of clinical suspicion.

Though some authors report clinical suspicion may be useful in adult blunt trauma [15], to our knowledge, the usefulness of clinical suspicion in guiding radiographic testing in pediatric patients has not been studied. The objective of this study was to investigate whether it is safe to base the decision to obtain radiographic imaging on clinical suspicion

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Table 1
Mechanisms of injury – frequencies of each pre-defined mechanism in our study.

Mechanism	Number (%)
Motor vehicle collision	317 (59.9)
Pedestrian/cyclist struck	110 (20.8)
Pedestrian	93 (17.6)
Cyclist	17 (3.2)
Fall down stairs	41 (7.8)
Fall from height	26 (4.9)
Assault	17 (3.2)
Motorcycle/all-terrain vehicle accident	1 (0.2)
Other	17 (3.2)
Heavy object fell on patient	14 (2.6)

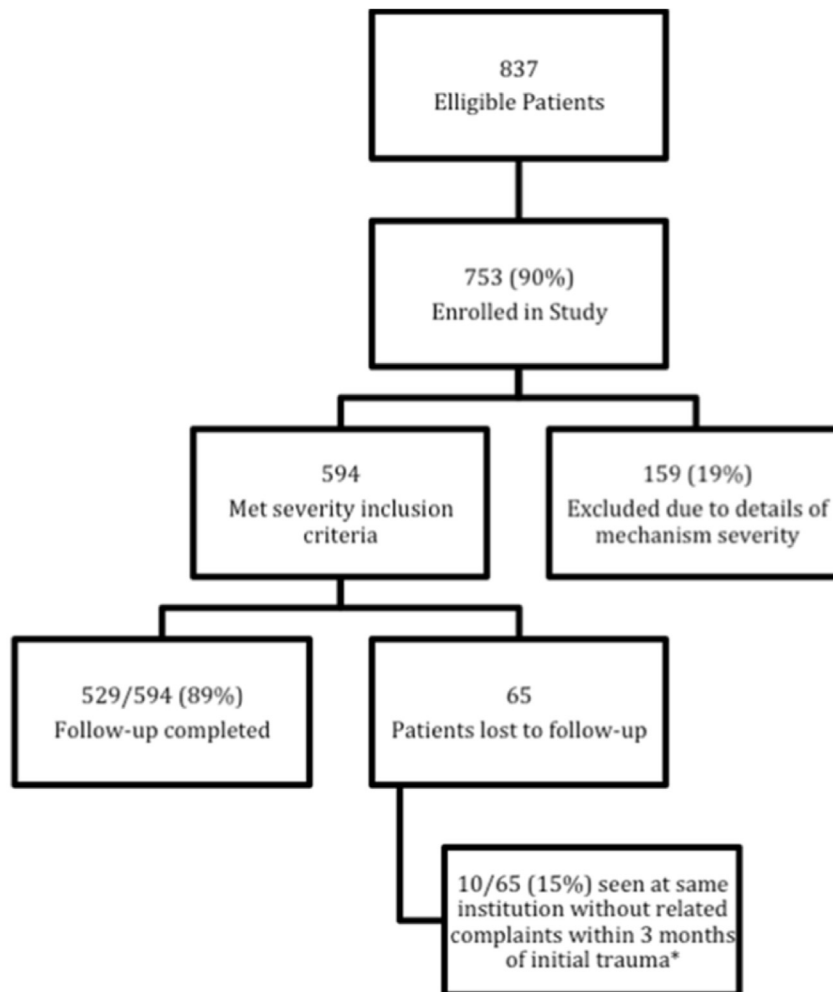
of the presence of a clinically significant injury (CSI) in children with blunt trauma due to severe mechanisms.

2. Methods

A prospective study was conducted in a pediatric emergency department (PED) of a level 1 trauma center. Patients <15 years of age presenting with blunt trauma due to predefined severe mechanisms (Table 1) were eligible. We chose to include only those with severe

mechanisms of injury because it is these patients whom several authors have suggested would be most likely to benefit from pan-CT [16–18]. Severe mechanisms of injury were chosen based on review of existing literature [1–3,5,12,19–23]. In order to facilitate enrollment and decrease the number of patients missed, physicians were asked to enroll all patients with severe mechanisms of injury. Those in whom the details of the mechanism of injury were less severe (i.e. pedestrians struck at <10 miles per hour (mph) by a passenger vehicle, motor vehicles collisions at <10 mph where the patient was appropriately restrained, falls from <10 ft, falls down <5 stairs, or assault without weapons by a single assailant) were subsequently excluded. Patients presenting >10 h after injury or transferred from another hospital were also excluded.

All attending physicians ($n = 16$) participated in the study by completing a study form, which recorded the mechanism of injury, elements of the history and physical examination, and their suspicions of CSI to 8 pre-defined body areas (head, face, neck, chest, abdomen, pelvis, thoracolumbosacral spine, extremities). Physicians used their discretion to either obtain imaging or observe the patient in the department until any suspicion of CSI resolved. Physicians also recorded whether any imaging was obtained solely at the request of a consulting service, whether the patient's clinical status deteriorated resulting in delayed imaging, whether the physician completed the study questionnaire prior to their knowledge of CT findings, and patient's ultimate disposition



* These patients were not included in data analysis

Fig. 1. Study patients.

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